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Claims

1. A system for protecting an electric motor (1) and its control circuit (2),
the control circuit (2) comprising a set of switches (Ch) to control the speed of
the motor (1)

5 the system being characterized by:

comprising a control central (7) connected to the control circuit (2), the control
central (7) being capable of measuring an electricity conduction time (T_c) of each of the
switches (Ch) and to measure a time (T_d) passed between the beginning of the conduction
of one of the switches (Ch) and the occurrence of a surge current, the surge being meas-
ured by means of a surge detector (3) which compares the value of a current (I_{sq}) that flows
10 through the control circuit (2) to a predetermined current (I_{lim}) value.

the central (7) making a comparison between the times (T_s , T_c) and being capa-
ble of determining whether the surge current results from an overload or from a short circuit
on the electric motor (1) or any of the switches (Ch).

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2. A system according to claim 1, characterized in that the control central (7) in-
dicates a condition of short-circuit of the motor (1) or on one of the switches (Ch) when the
time (T_s) is shorter than the time (T_c) multiplied by a factor (k) that ranges from 0 to 1, and
the central (7) indicates a condition of surge of the motor (1) when the time (T_d) is longer
20 than the time (T_c) multiplied by the factor (k).

3. A system according to claim 2, characterized in that the factor (k) is equal to
0.5.

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4. A method for protecting an electric motor (1) and its circuit (2),
the speed control of the motor (1) being carried out by means of a set of
switches (Ch),

the method being characterized by comprising the steps of:

measuring an electricity conduction time (T_c) of each of the switches (Ch),

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measuring a time (T_d) passed between the beginning of conduction of one of the
switches (Ch) and the occurrence of a surge, and

comparing the times (T_d , T_c) and consequently determining whether the surge
current results from an overload or from a short-circuit of the electric motor (1) or on any of
the switches (Ch).

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5. A method according to claim 4, characterized in that, in the comparison step, a condition of short-circuit of the motor (1) or on one of the switches (Ch) is indicated when the time (T_d) is shorter than the time (T_c) multiplied by a factor (k) that ranges from 0 to 1, and an overload condition of the motor (1) is indicated when the time (T_d) is longer than the time (T_c) multiplied by the factor (k).

6. A method according to claim 5, characterized in that, in the comparison step the factor (k) is equal to 0.5.

10 7. An electric motor (1) having phases (F),
the phases (F) being fed by a set of switches (Ch), and
the switches (Ch) being controlled by a control circuit (2) to modulate a voltage
that is applied to the phases (F) to control the speed of the motor (1),
the motor (1) being characterized in that the control of the switches (Ch) is car-
15 ried out by a control central (7) connected to the control circuit (2),
the control central (7) being capable of measuring the electricity conduction time
(T_c) of each of the switches (Ch) and to measure the time (T_d) passed between the begin-
ning of conduction of one of the switches (Ch) and the occurrence of a surge current,
the surge being a value of a current (I_{as}) that flows through the phases (F) higher
20 than a predetermined current (I_{LMT}) value,
the central (7) making a comparison between the times (T_d , T_c) and being capa-
ble of determining whether the surge current results from an overload or from a short-circuit
of the phases (F) of the electric motor (1) or any of the switches (Ch).

25 8. A motor according to claim 7, characterized in that the control central (7) indi-
cates a condition of short-circuit of the motor (1) when the time (T_d) is shorter than the time
(T_c) multiplied by a factor (k) that varies between 0 and 1, and the central (7) indicates a
condition of overload of the motor (1) when the time (T_d) is longer than the time (T_c) multi-
plied by the factor (k).

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9. A motor according to claim 8, characterized in that the factor (k) is equal to
0.5.